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EXAMINER MCCRACKEN, DANIEL				
ART UNIT 1793		PAPER NUMBER		
NOTIFICATION DATE 03/24/2010		DELIVERY MODE ELECTRONIC		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/594,026

Applicant(s)

STEVENS, STEVEN A.

Examiner

DANIEL C. MCCracken

Art Unit

1793

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 September 2006.
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-60 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) ☐ Claim(s) _____ is/are allowed.
6) ☒ Claim(s) 1-60 is/are rejected.
7) ☐ Claim(s) _____ is/are objected to.
8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
10) ☒ The drawing(s) filed on 25 September 2006 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/GS/US)
Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____

DETAILED ACTION

Citation to the Specification will be in the following format: (S. # : ¶/L) where # denotes the page number and ¶/L denotes the paragraph number or line number. Citation to patent literature will be in the form (Inventor # : LL) where # is the column number and LL is the line number. Citation to the pre-grant publication literature will be in the following format (Inventor # : ¶) where # denotes the page number and ¶ denotes the paragraph number.

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Information Disclosure Statement

The information disclosure statements (IDS) submitted on 9/25/2006 and 4/9/2007 were filed prior to the first action on the merits. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

I. Claim 30 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With respect to Claim 30, it is unclear whether two different carbon sources are implied or not. Placing a carbon source in the carbonaceous material is redundant, as the carbonaceous material already "has carbon" in it (*i.e.* making it a carbonaceous material).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

I. Claim 60 rejected under 35 U.S.C. 102(b) as being anticipated by US 6,827,823 to Takikawa, et al.

Claim 60 requires "reacting at least a transition metal, yttrium source and carbon in the presence of a nitrogen-containing gas and helium." Takikawa teaches transition metals and yttrium. (Takikawa 3: 33-37). Nitrogen and helium are taught. (Takikawa 3: 53-56). Carbon is taught. (Takikawa 3: 28-32). Nanotubes are formed. (Takikawa 3: 19-24).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

I. Claims 1-8, 10-16, 18, 23, 25-33, 35-41, 43, 48-59 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over US 6,827,823 to Takikawa, et al. in view of US 6,303,760 to Dorn, et al to show a state of fact.

With respect to Claim 1, this claim requires “introducing at least one carbon source, at least one nitrogen source, at least one copper source, at least one yttrium source, at least one transition metal, and at least one trimetasphere-forming metal into a reaction chamber.” Takikawa teaches graphite, *i.e.* a carbon source (Takikawa 3: 28-32), nitrogen (Takikawa 3: 53-56), copper (Takikawa 3: 33-37), yttrium (Takikawa 3: 33-37), and a trimetasphere forming metal, Lanthanum - *i.e.* one of Applicants “A” elements and one of Applicant’s “B” elements, *see* (S. 3: 19-30), as a group IIIB element – at (Takikawa 3: 33-37). Note that Takikawa explicitly provides mixtures of all metals. (Takikawa 3: 33-37). Takikawa also provides for gasses alone or in combination. (Takikawa 3: 53-56). Claim 1 further requires “reacting the at least one carbon source, nitrogen source, copper source, yttrium source, transition metal, and trimetasphere-forming metal under conditions effective to produce a reaction product comprising trimetaspheres, nanotubes, and at least one of (i) fullerenes and (ii) metallofullerenes.” Takikawa teaches the ubiquitous arc discharge process, *i.e.* the materials are “reacted.” *See e.g.* (Takikawa

3: 5 *et seq.*). Takikawa teaches forming *inter alia* nanotubes and fullerenes. (Takikawa 3: 19-24). Takikawa does not teach *in haec verba* the "trimetaspheres" and "metallofulleremes" required by the claim. However, given that the same reagents and process is taught, it is expected that the "trimetaspheres" and "metallofullerenes" are produced in the reaction mixture of Takikawa. The rationale tending to show inherency is the same carbon sources, catalysts, gasses, etc. being taught. Likewise, "trimetaspheres" and "metallofullerenes" are known to be made from processes employing the claimed catalysts. *See e.g.* (Dorn 1: 55 *et seq.*) (trimetaspheres) *and* (Dorn 1: 32) (metallofullerenes). MPEP 2112 V states "[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on inherency' under 35 U.S.C. 102, on prima facie obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted]." The burden of proof is similar to that required with respect to product-by-process claims. *In re Fitzgerald*, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)). *See also* MPEP 2112 III (discussing 102/103 rejections). As to Claim 2, see discussion in Claim 1 related to products formed. As to Claim 3, graphite is taught. (Takikawa 3: 28-32). As to Claim 4, powder graphite is reasonably suggested. *Id.* Note that whether or not it is shaped into an electrode, the graphite is still "powder." As to Claim 5, see discussion of Claim 1 for metals, etc. and Claim 3 for graphite. Electrodes (*i.e.* "containers") are taught. (Takikawa 3: 28 *et seq.*). As to Claim 6, rods/electrodes are taught. *Id.*, *See also* (Takikawa "Fig. 1"). As to Claim 7, *see* (Takikawa 3: 55-56). As to Claim 8, *see Id.* As to Claim 10, nitrides are taught. (Takikawa 3: 33-37). As to Claim 11, copper is taught. (Takikawa 3: 33-37). As to Claim 12, nanotubes are

taught. (Takikawa 3: 19-24). As to Claim 13, the metals are taught. (Takikawa 3: 33-37). As to Claim 14, yttrium is taught. *Id.* As to Claim 15, Lanthanum is taught. *Id.* As to Claim 16, Yttrium is taught. *Id.* As to Claim 18, Ni, Y, and Cu and N₂ are all taught. (Takikawa 3: 33-37, 3: 53-56). As to Claim 23, arc discharge is taught. (Takikawa 6: 33 *et seq.*).

With respect to Claims 25-26, these are product by process claims. The discussion accompanying Claim 1 is relied upon. Note also, to the extent Applicants believe there to be process differences, product-by-process claims are not limited by the process steps, but rather by the structural or compositional features suggested by the claims. *See generally* MPEP 2113. Here, all of the materials are taught and the arc discharge process is taught (see above). Ergo, it is expected that all morphologies are taught.

With respect to Claim 27, this claim requires “introducing into a reaction chamber at least one copper source, at least one yttrium source, at least one transition metal, and at least one trimetasphere-forming metal in a carbonaceous material.” Takikawa teaches copper (Takikawa 3: 33-37), yttrium (Takikawa 3: 33-37), transition metals, *e.g.* Fe, Co, Ni (Takikawa 3: 33-37), and a trimetasphere forming metal, Lanthanum - *i.e.* one of Applicants “A” elements and one of Applicant’s “B” elements, *see* (S. 3: 19-30), as a group IIIB element – at (Takikawa 3: 33-37), and graphite, *i.e.* a carbon source (Takikawa 3: 28-32). Note that Takikawa explicitly provides mixtures of all metals. (Takikawa 3: 33-37). Claim 27 further requires “vaporizing the at least one copper source, yttrium source, transition metal, trimetasphere-forming metal and carbonaceous material in the presence of nitrogen and producing a reaction product comprising trimetaspheres, nanotubes, and at least one of (i) fullerenes and (ii) metallofullerenes.” Takikawa teaches an arc discharge/vaporization process (Takikawa 3: 1 *et seq.*). As to the products produced, the

discussion accompanying Claim 1 related to trimetaspheres, etc. is relied on. As to Claim 28, see discussion of Claim 1. As to Claim 29-30, graphite is taught. (Takikawa 3: 28-32). As to Claim 31, electrodes/rods are taught. (Takikawa 3: 28 *et seq.*, “Fig. 1”). As to Claim 32, nitrogen is taught. (Takikawa 3: 53-56). As to Claim 33, nitrogen and helium are taught. *Id.* As to Claim 35, nitrides are taught. (Takikawa 3: 33-37). As to Claim 36, copper is taught. *Id.* As to Claim 37, nanotubes are taught. (Takikawa 3: 19-24). As to Claim 38, transition metals are taught. (Takikawa 3: 33-37). As to Claim 39, Yttrium is taught. *Id.* As to Claim 40, Lanthanum is taught. *Id.* As to Claim 41, Yttrium is taught. *Id.* As to Claim 43, Ni, Y, and Cu and N₂ are all taught. (Takikawa 3: 33-37, 3: 53-56). As to Claim 48, arc discharge is taught. (Takikawa 6: 33 *et seq.*).

With respect to Claims 49-50, these are product by process claims. The discussion accompanying Claim 1 is relied upon. Note also, to the extent Applicants believe there to be process differences, product-by-process claims are not limited by the process steps, but rather by the structural or compositional features suggested by the claims. *See generally* MPEP 2113. Here, all of the materials are taught and the arc discharge process is taught (see above). Ergo, it is expected that all morphologies are taught.

With respect to Claim 51, this claim requires “introducing a carbonaceous material and a powder mixture of at least one copper source, at least one yttrium source, at least one transition metal, and at least one trimetasphere-forming metal into a reaction chamber.” Takikawa teaches graphite, *i.e.* a carbon source (Takikawa 3: 28-32), copper (Takikawa 3: 33-37), yttrium (Takikawa 3: 33-37), transition metals, *e.g.* Fe, Co, Ni (Takikawa 3: 33-37), and a trimetasphere forming metal, Lanthanum - *i.e.* one of Applicants “A” elements and one of Applicant’s “B”

elements, *see* (S. 3: 19-30), as a group IIIB element – at (Takikawa 3: 33-37). Reactors are discussed throughout Takikawa. (Takikawa 4: 4 *et seq.*). Note that Takikawa explicitly provides mixtures of all metals. (Takikawa 3: 33-37). Takikawa also provides for gasses alone or in combination. (Takikawa 3: 53-56). Claim 51 further requires “reacting the carbonaceous material and powder mixture in the presence of a gas mixture of nitrogen and helium to produce a reaction product comprising trimetaspheres, nanotubes, and at least one of (i) fullerenes and (ii) metallofullerenes.” Nitrogen and helium are taught. (Takikawa 3: 53-56). As to the products produced, the discussion accompanying Claim 1 related to trimetaspheres, etc. is relied on. As to Claim 52, vaporization and condensation (to yield the product) is taught. (Takikawa 3: 1-9). As to Claim 53, see discussion of Claim 1.

With respect to Claim 54, this claim requires “introducing at least one metal, carbon, nitrogen and copper into a reaction chamber.” Takikawa teaches graphite, *i.e.* a carbon source (Takikawa 3: 28-32), copper (Takikawa 3: 33-37), metals, *e.g.* Fe, Co, Ni (Takikawa 3: 33-37), and nitrogen (Takikawa 3: 53-56). Claim 54 further requires “reacting the at least one metal, a carbon, nitrogen and copper to produce trimetaspheres.” As to the products produced, the discussion accompanying Claim 1 related to trimetaspheres, etc. is relied on. As to Claim 55, Lanthanum is taught. (Takikawa 3: 33-37). As to Claim 56, nitrogen is taught. (Takikawa 3: 53-56).

With respect to Claims 57-58, Takikawa teaches a reaction product. (Takikawa 3: 19-24). See above discussion of Claim 1 related to trimetaspheres and metallofullerenes. As to Claim 59, this is a product-by-process claim, but nonetheless, arc discharge is taught. (Takikawa 6: 33 *et seq.*).

II. Claims 9, 19-22, 34, and 44-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,827,823 to Takikawa, et al. in view of US 6,303,760 to Dorn, et al.

The discussion of Claims 1 and 27 as set forth in the 102/103 rejection (“I”) *supra* are expressly incorporated herein by reference. As to Claims 9 and 34, these claims recite pressures and flow rates of the gasses. As to the pressures, Takikawa teaches pressures of 0.5-1.5 atmospheres. *See e.g.* (Takikawa 6: 44-47). This corresponds to 380-1140 Torr, which the claimed range falls within. As to the flow rates, note that Takikawa teaches certain ratios (Takikawa 6: 44-47) and provides for controlling the gas. (Takikawa 6: 65). The gas atmosphere is recognized within the art as affecting the yield of metallofullerenes. *See* (Dorn 5: 39-51). Optimizing a result-effective variable does not impart patentability. *See* MPEP 2144.05. As to Claims 19-22 and Claims 44-47, these claims recite various catalyst ratios. Takikawa suggests the combination of various catalyst affects the rate of vaporization within the electrode. (Takikawa 10: 1-13). Likewise, Dorn teaches that the amount of catalyst will produce the desired metallofullerene. (Dorn 5: 6 *et seq.*). Optimizing a result-effective variable does not impart patentability. *See* MPEP 2144.05.

III. Claims 17 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,827,823 to Takikawa, et al. in view of Zhang, et al., *Heterogeneous growth of B-C-N nanotubes by laser ablation*, Chemical Physics Letters 1997; 279: 264-269 (hereinafter “Zhang at ___”).

The discussion of Claims 1 and 27 as set forth in the 102/103 rejection (“I”) *supra* are expressly incorporated herein by reference. Claims 17 and 42 are both drawn to methods of making the graphite electrode. To the extent Takikawa doesn’t disclose these minor details, note

that the temperatures employed appear commonplace in making graphite catalyst targets. *See* (Zhang at 265, col. 1) (describing a graphite pellet mixed with catalyst and heated before the reaction takes place). This claim would appear to reflect aggregation of known techniques (forming the target/electrode – Zhang, Fan) to be incorporated into other known techniques (arc discharge - Takikawa). This does not impart patentability. *See* MPEP 2143. Optimizing the time is an obvious expedient, the articulated rationale being that the skilled artisan would recognize that sufficient heating time is necessary to cure any binders and fuse catalysts to the carbonaceous material prior to attaching them to the reactor, etc.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL C. MCCracken whose telephone number is (571)272-6537. The examiner can normally be reached on Monday through Friday, 9 AM - 6 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley S. Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Daniel C. McCracken/
Daniel C. McCracken
Examiner, Art Unit 1793
DCM

